AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph beginning on page 1, line 8 as follows:

--In MPEG (Moving Pictures Experts Group), there ~~is~~ are three picture types: I-picture, P-picture and B-picture. I-pictures are coded without ~~reference~~ referring to other pictures. I-pictures ~~They~~ provide the coded sequence with access points, which ~~is~~ are the starting points for ~~of~~ the decoding process, but are coded with only moderate compression. P-pictures are coded more efficiently using motion compensated prediction from a past I-picture or P-picture and are generally used as a reference for further prediction. B-pictures provide the highest degree of compression but require both past and future reference pictures for motion compensation. B-pictures are never used as references for prediction. The organization of the three picture types in a sequence is very flexible. The choice of the sequence is ~~left to~~ determined by the encoder and will depend on the requirements of the application.--

Please amend the paragraph beginning on page 1, line 18 as follows:

--Because the B-pictures must refer to~~reference~~ the past and future reference pictures, ~~so~~ the encoding process of the B-pictures is ~~has to be~~ delayed until the future reference picture is coded. Therefore, the display order is different to the coding order. This is called the reordering of B-pictures.--

Please amend the paragraph beginning on page 2, line 7 as follows:

--Typically, if the input signal for the encoder is in NTSC (National Television System Committee) format (29.97 fps), the GOP structure with N = 15 and M = 3 is used. If the input

signal is in PAL (25 fps) or film format (24 fps), the GOP structure with N = 12 and M = 3 is used. These fixed default settings can achieve a good balance between the complexity of an encoder and the coding performance ~~for~~ of most types of videos.--

Please amend the paragraph beginning on page 2, line 13 as follows:

--Typically, the editing process would cut the whole video sequence into pieces based on the scene, and then rearrange them to form a new video sequence. If a video sequence is coded with a fixed pattern composed with only I- and P-pictures, like IPPPPIPPPP..., the situation is pretty simple. If a scene change occurs~~red~~ in an I-picture of the video sequence (IPPPPIPPPP...), the video sequence can be cut into two parts without any loss. If a scene change occurs~~red~~ in a P-picture of the video sequence, the former part of the video sequence is in a normal operation ~~no problem~~, but the remaining part of the video sequence has to be re-encoded~~r~~. The first P-picture of the remaining part of the video sequence has to be decoded and then re-encode to an I-picture. However, because the re-encoded I-picture differs from the original P-picture, there will be some error propagations. Re-encode the whole remaining part of the GOP until the next I-picture would be a better solution, but we would remind that re-encoding degrades the image quality significantly.--

Please amend the paragraph beginning on page 2, line 24 as follows:

--If there are B-pictures in the coded sequence, video editing becomes more complex. Please refer~~ence~~ to Fig. 2. If a scene change occurs~~red~~ in the picture just after the I-picture in the coding order, like the picture B_4, cutting from picture I_6 can separate the two scenes easily.

However, even the picture P_3 and picture B_4 are belong to different scenes, there would be some macroblocks in picture B_4 and B_5 which needs to ~~reference to~~ the picture P_3. Therefore the picture B_4 and B_5 have to be re-encoded according~~with only referencing~~ to the picture I_6 merely. Discarding the pictures B_4 and B_5 is the easiest way, but losing the beginning ~~some~~ pictures of a scene would not be acceptable.--

Please amend the paragraph beginning on page 3, line 9 as follows:

--If a scene change occurs~~red~~ in the picture B_5, the former part and the remaining part of the GOP have some pictures to be re-encoded. The picture B_4 has to be re-encoded to a P-picture and then append to the former part. In the remaining part, the coded data of the picture B_4 is removed and the picture B_5 has to be re-encoded.--

Please amend the paragraph beginning on page 3, line 13 as follows:

--If a scene change occurs~~red~~ in the picture I_6, the remaining part of the GOP has only to remove the coded data of the pictures B_4 and B_5. However, the former part of the GOP requires a complicate process. One solution is to re-encode the picture B_5 to a P-picture, and then re-encode the picture B_4 according~~by referencing~~ to the pictures P_3 and B_5. Another solution is to change the two B-pictures B_4 and B_5 to two P-pictures.--

Please amend the paragraph beginning on page 3, line 18 as follows:

--If a scene change occurs~~red~~ in the picture B_7, the former part of the GOP doesn't needs ~~no~~ any additional process, ~~but~~ and a new I-picture has to be generated for the remaining part. A

choice is to change the picture B_7 to an I-picture, and then re-encode the remaining GOP. However, because the B-pictures usually coded with a lower quality than the I- and P-pictures, a better choice is ~~would be~~ to change the picture P_9 to an I-picture, and re-encode the remaining GOP. The pictures B_{45} and B_{56} are B-pictures with only backward reference. This method can also reduce the number of P-pictures to reduce the error caused by referring ~~referencing~~ to a re-encoded picture.--

Please amend the paragraph beginning on page 4, line 2 as follows:

--If a scene change occur~~sred~~ in the picture B_8, the former part of the GOP has only to re-encode the picture B_7 to a P-picture. The remaining part of the GOP can change the picture P_9 to an I-picture and then re-encode the remaining part of the GOP.--

Please amend the paragraph beginning on page 4, line 5 as follows:

--Finally, if a scene change occur~~sred~~ in the picture P_9, the former part of the GOP is processed like the situation of picture I_6. For the remaining part of the GOP, the picture P_9 has to be changed to an I-picture, and then re-encode the remaining GOP.--

Please amend the paragraph beginning on page 4, line 11 as follows:

-- Generally, the I-pictures are designed for the purpose of random access and preventing of error propagation. The P-pictures use the motion compensation to remove the temporal redundancy between the current picture and the reference picture to improve the compression performance. However, if there is almost no temporal redundancy between the current picture

and the reference picture, such as~~for example~~ a scene change, coding a picture as a P-picture can't obtain any benefit. In this case, coding a picture as an I-picture can achieve the same coding quality with fewer bits. Therefore, an encoder has to detect the existence of a scene change and then start a new GOP. There are~~is already~~ many researches of ~~focus on~~ the scene change detection and the algorithm~~then~~ of adjusting the rate control. ~~how to adjust the rate control algorithm.~~ A general idea is to detect the difference of the current picture and the reference picture from the result of motion estimation. If more than a percentage of macroblocks select the intra-coded mode, the encoder can decide that there is only few temporal redundancy existed, and therefore a scene change can be detected.--

Please amend the paragraph beginning on page 5, line 1 as follows:

--However, when a scene change is detected, if the encoder just starts a new GOP ~~when detect a scene change but with~~ without ~~no~~ any ~~other~~ effort, the re-encoding of some pictures would be unavoidable during~~when~~ the video sequence ~~is being~~ editing process~~,~~ as ~~we~~ described above.--

Please amend the paragraph beginning on page 5, line 5 as follows:

--In view of the above-mentioned problems, an object of the invention is to provide a video encoding method capable of editing scene changes ~~with support for editing when scene changed~~.--

Please amend the paragraph beginning on page 5, line 7 as follows:

--To achieve the above-mentioned object, the video encoding method ~~with support for editing when scene changed~~ of the present invention encodes the pictures by the coding order when there are not scenes changed and encodes the pictures by a special coding process when there are scenes changed. Because the video encoding method encodes the pictures with considering the states of scenes changed and generates a new GOP when a scene change occurred, the video sequence can be cut into two parts by an image editing process without re-encoding.--

Please amend the paragraph beginning on page 6, line 10 as follows:

--Before a scene change is detected, the encoder encodes the video sequence with a fixed GOP structure. Once a scene change is detected, the encoder decides how to encode the following pictures based on the type and position in a GOP of the present ~~just~~ coded pictures. Please note that because the B-pictures have to be coded just after the future reference picture being coded, a scene change ~~can~~ needs to be detected ~~far~~ before the coding ~~actually~~ happens. Fig. 2 depicts an example. The encoder captures pictures ~~are captured~~ and stores~~d~~ them into a buffer ~~by~~in the display order. The picture B_4 and B_5 are captured ~~but can't~~ and not being ~~en~~coded until the picture I_6 is coded. ~~Assume that~~ If the encoder can encode a picture in each period of capturing a picture~~.~~, ~~T~~the picture I_6 is captured and ~~then~~ encoded in the same period. In the next period, the picture B_4 is encoded while the picture B_7 is being captured. The picture B_5 is encoded in the same period ~~that~~ when the picture B_{8}~~7~~ is captured. The picture P_9 only needs to

take ~~only~~ the picture I_6 ~~to~~ as a reference~~,~~ so that it can be captured and encoded in the same period.--

Please amend the paragraph beginning on page 6, line 23 as follows:

--For ~~A~~an encoder, which encodes the video sequence with a fixed GOP structure, ~~that~~ the distance between two reference pictures is defined as M and a reference picture (I- or P-picture) is represented as an R. The first B-picture (in the display order) after the forward reference picture R^X is called B^X_1, the second B-picture is called B^X_2, and so on. The final one before the back~~ward~~ reference picture is called B^X_{M-1}. Fig. 3 illustrates an example of the GOP in the display order and coding order according to this definition.--

Please amend the paragraph beginning on page 7, line 7 as follows:

--A. A scene change occur~~red~~ in the first B-picture--

Please amend the paragraph beginning on page 7, line 8 as follows:

--If there is no scene change occurred in the pictures from B^A_1 to R^B, the picture B^A_1~ B^A_{M-1} is captured and stored until the picture R^B is captured and coded. If the scene change~~d~~ in the picture B^B_1, the pictures until R^B would belong to the former GOP and the pictures from B^B_1 would belong to a new GOP. After coding the picture B^A_{M-1}, if the encoder starts a new GOP and encodes the following pictures without refer~~ren~~ceing to the picture R^B, it can completely separate the video sequence into two parts. An editing process can cut the video sequence from the new GOP without any re-encoding.--

Please amend the paragraph beginning on page 7, line 16 as follows:

--There are two strategies to start a new GOP. One is to start a fixed GOP structure from I-picture. In the above example, the original picture B^B_1 is changed to an I-picture R^C, the following M-1 pictures are B-picture B^C_1~B^C_{M-1}, the next picture is a P-picture R^D, then the following-up pictures are the M-1 B-pictures, and so on. Fig. 4 illustrates an example of this case.--

Please amend the paragraph beginning on page 7, line 21 as follows:

--However, a new GOP need not be started with an I-picture in the display order. By observing the coding order in Fig. 4, we can find that there ~~is~~are no B-pictures between the picture R^C and R^D. B-pictures can be coded with lower quality and ~~save the~~ bit rate ~~for~~ than the I-pictures and P-pictures. If there are too many reference pictures in a short duration, the result is that each reference picture can't obtain enough bits to achieve a higher quality. Therefore, the second strategy of starting a new GOP is trying to maintain the ratio on the number of B-pictures and reference pictures. The first M-1 pictures of the new GOP are B-pictures, the next picture is an I-pictures, the following pictures are~~by~~ ~~other~~ M-1 B-pictures, and then the picture is a P-picture, and so on. Fig. 5 illustrates an example of this case.--

Please amend the paragraph beginning on page 8, line 7 as follows:

--It ~~S~~seems that the picture type of each picture is remaining the same as no scene change occurred. Actually, the difference is that the picture B^B_1~B^B_{M-1} ~~have~~ only ~~backward~~ referen~~ce~~ to

the back picture R^C. In fact, there may not be M-1 B-pictures before the picture R^C, and can be adjusted freely.--

Please amend the paragraph beginning on page 8, line 11 as follows:

--B. A scene change occursred in the second B-picture--

Please amend the paragraph beginning on page 8, line 12 as follows:

--Please reference to Fig. 3. If a scene change occursred in the picture B^B_2, the picture B^B_1 belongs to the former GOP and the pictures from B^B_2 form a new GOP. The new GOP can be encoded with the same method described in subsection A.--

Please amend the paragraph beginning on page 8, line 15 as follows:

--A GOP can be ended by a reference picture. Therefore the picture B^B_1 must be encoded as a reference picture. Further,~~There is no reason to not encode~~ the picture B^B_1 as a P-picture but an I-picture. Fig. 6 illustrates an example of this case.--

Please amend the paragraph beginning on page 8, line 18 as follows:

--C. A scene change occursred in the n-th B-picture--

Please amend the paragraph beginning on page 8, line 19 as follows:

--If a scene change occurs~~red~~ in the n-th B-picture after the reference picture R^X, $2 \leq n \leq M-1$, the pictures until B^X_{n-1} belong to the former GOP and the pictures from B^X_n form a new GOP. The new GOP is encoded with the same method described in subsection A.--

Please amend the paragraph beginning on page 8, line 23 as follows:

--Based on the method described in section B, the encoder will encode the picture B^X_{n-1} as a P-picture, and the pictures $B^X_1 \sim B^X_{n-2}$ (if any) are encoded as B-pictures by referencing to the picture R^X and the new generated P-picture.--

Please amend the paragraph beginning on page 9, line 2 as follows:

--D. A scene change occurs~~red~~ in a reference picture--

Please amend the paragraph beginning on page 9, line 3 as follows:

--Please refere~~nce~~ to Fig. 3. If a scene change occurs~~red~~ in the picture R^B, the picture B^A_{M-1} belongs to the former GOP and the pictures from R^B form a new GOP. The former GOP can be coded by the method described in subsection C. The new GOP could be encoded with the same method described in subsection A.--

Please amend the paragraph beginning on page 9, line 17 as follows:

--Step 708: If the picture PIC_{n-1} is not coded as a reference picture, the flowchart jumps to step S710. If the picture PIC_{n-1} is coded as a reference picture, the flowchart jumps to step S716.--

Please amend the paragraph beginning on page 9, line 22 as follows:

--Step S714: If there are B-pictures preceding the picture PIC_{n-1}, coding the B-pictures and jumping to step S718.--

Please amend the paragraph beginning on page 9, line 24 as follows:

--Step S716: If there are B-pictures preceding the picture PIC_{n-1}, coding the B-pictures and jumping to step S718.--